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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/734,488	12/11/00	LIGHTNER	G

EXAMINER	
DAVIS, R	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/734,488	Applicant(s) LIGHTNER, GENE E.	
	Examiner Ruth A. Davis	Art Unit 1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 – 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim(s) are narrative in form and replete with indefinite and functional or operational language. Examples of such language include but are not limited to:

Claim 1 and its dependents are drawn to a method of separating ethanol (EtOH) from a fermentation broth however are rendered vague and indefinite because it is not clear how CO2 humidifies EtOH as it is not water or contains water.

Claim 1 and its dependents are confusing because it is not clear what the phrase "carbon dioxide, containing humidified ethanol" means as it is not adequately defined or supported by the claim language or specification.

Claim 1 and its dependents are vague and indefinite for reciting "removing means for separation" because it is not clear if the phrase is meant to define a means, or if a "removing means" is a defined or specific thing that is not defined. The claim language is confusing because it is not clear what is being removed or separated from what.

The claims are further confusing for reciting "separating sludge" because it is not clear to what "sludge" refers or where it originates.

Claim 1 recites the limitation "said mixture" in line 15. There is insufficient antecedent basis for this limitation in the claim. It is not clear what the mixture is.

Claim 1 is further confusing because it is not clear which limitations are functional. Moreover, it is not clear if recited functions are steps to the method that must occur, or if they are merely descriptive in nature.

Claim 2 is confusing because it is not clear what is being "substantially maitained".

Claim 3 is confusing for reciting "established at a temperature and maintained" because it is not clear what temperature must be maintained, as the claim language does not provide it.

Claim 4 is rendered indefinite for reciting "capable of" because it is not clear how a sugars is capable of fermenting something. Furthermore, the phrase is indefinite because it is not clear if the recited function must occur, or can merely potentially occur.

Claim 4 is further confusing because it is not clear if applicant intends to incorporate a Markush group as the proper language is not employed. For proper Markush language, members of the group must follow a "A, B, and C" format. It is not clear if applicant intends sugars to be chosen from glucose and xylose together, or glucose or xylose alternatively.

Claim 5 is confusing for reciting "carbon dioxide, containing humidified ethanol" because it is not adequately defined by the claim language or specification.

Claim 6 is rendered vague and indefinite for reciting the phrase "capable of" because it is not clear if the recited function must occur, or if it can potentially occur.

The claim is further confusing because it is not clear what enzymes are being formed.

Claim 8 is rendered vague and indefinite because it is not clear if the broth and sludge are settled prior to removal or after removal from the fermentation vessel.

Claim 8 is confusing because it is not clear if the broth and sludge are settled within the fermentation vessel or a separate vessel.

Claim 9 is confusing because it is not clear what volume is being maintained.

Claim 10 is rendered vague and indefinite for reciting the phrase "capable of" because it is not clear if the recited function must occur, or if it can potentially occur.

Claim 10 is further confusing because it is not clear what required enzymes are being formed.

Claims 11,12 and 17 are rendered vague and indefinite for reciting "carbon dioxide, containing humidified ethanol" because the phrase is not adequately defined by the claim language or specification.

Claim 13 is rendered indefinite for reciting "extactate" because the claim language or specification does not adequately define this term.

Claim 13 is confusing because it is not clear what if gasoline is dissolved in EtOH, EtOH is dissolved in gasoline or EtOH is dissolved in something else.

Claim 14 is indefinite for reciting "extractate" because the claim language or specification does not adequately define this term.

Claim 15 is confusing because it is not clear what vapor or raffinate is being produced.

Claim 16 recites the limitation "the carbon dioxide" in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 16 is confusing because it is not clear how CO2 can further humidify something, as indicated by the phrase "so that further humidification by CO2".

Claim 16 is confusing for reciting the phrase "humidified water" because it is not clear how water can be further humidified.

Claims 18 and 19 recite the limitation "the gasohol containing water" in line 1. There is insufficient antecedent basis for this limitation in the claims.

Due to the exceedingly vague and indefiniteness of the claim language, all claims have been considered as interpreted by examiner.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 – 4 and 6 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hallberg (US 5,070,016) in view of Tedder (US 4,517,298).

Applicant appears to claim a method for separating ethanol (EtOH) from a fermentation broth comprising fermenting microorganisms, nutrients and sugars as a broth, which produces EtOH and carbon dioxide (CO2), providing a flow of CO2, removing the CO2 and EtOH, separating EtOH and CO2, separating sludge and broth followed by adding microorganisms, nutrients and sugars wherein the concentration of EtOH of the broth is between 6 – 12%. The fermentation broth contains nutrients needed/utilized for fermentation, temperatures are

maintained at isothermal (constant) temperatures, the sugars are selected from glucose, xylose and mixtures thereof, the microorganisms are yeasts capable of forming enzymes required for fermentation, the microorganisms are capable of forming enzymes required for fermentation and/or the fermentation is continuous.

Hallberg teaches a process for making EtOH by fermenting bacteria wherein CO2 is a by-product (abstract). The process includes fermenting a vegetable material (cellulosic material containing glucose and xylose, see US 5789210 col.1 line 39-45) in a broth to produce EtOH and CO2 wherein the EtOH is recovered from the broth (col.5 line 5-15). The fermentation vessel contains the microorganism and the CO2 exits (or separates from) the vessel where it is recovered in a CO2 recovery unit (col.5 line 67-col.6 line 5). Although Hallberg does not specifically teach providing CO2 to the fermentation vessel, Hallberg teaches inherent characteristics of yeast in EtOH production require an aerobic stage, which produces CO2 (col.2 line 5-10), thereby providing a flow of CO2 to the fermentation vessel. Finally, Hallberg teaches ethanol is commercially produced by yeast fermentation of fermentable sugars (col.1 line 65-68).

Hallberg does not specifically teach the method wherein sludge is removed and microorganisms, nutrients and sugars are added. However, Hallberg does teach the method utilizing continuous fermentation (col.8 line 37-41). Furthermore, Tedder teaches a process to produce ETOH wherein continuous fermentation of a feedstock (col.2 line 45-55) is continuously replaced with microorganisms while a fermentation liquor and sludge is withdrawn (col.2 line 45-65). Although the references do not specifically teach the method wherein the sludge has settled from the broth, it would have been obvious to one of ordinary skill in the art to separate the broth from the sludge prior to re-introducing the broth to the fermentation vessel

because it was routine practice at the time of the invention. Moreover, at the time of the invention, it would have been obvious to one of ordinary skill in the art to remove sludge and replace the microorganisms, nutrients and sugars as it was a common practice applied to continuous fermentation in the art at the time of the invention as demonstrated by Tedder. Moreover, one of ordinary skill in the art would have been motivated by conventional practice to remove sludge and replace microbes and substrates with a reasonable expectation of success for recovering EtOH from a continuous fermentation broth.

Hallberg does not specifically teach the fermentation broth containing nutrients needed for fermentation or microbes capable of forming enzymes required for fermentation. However, by practicing the method of Hallberg, fermentation is facilitated, therefore indicating the broth contained the required nutrients and the microorganisms were capable of fermentation.

Hallberg does not teach regulating the concentration of EtOH within the broth to between 6 – 12%. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art to regulate the EtOH to a desired concentration because Tedder teaches continuous fermentation allows the concentration of alcohol in a fermentation vessel can be maintained at a constant desired level (col.2 line 60 – col.3 line 5). Moreover, at the time of the invention, one of ordinary skill in the art would have been motivated to optimize the EtOH concentration via continuous fermentation because it was known in the art to facilitate a regulated desired concentration as demonstrated by Tedder.

Hallberg does not teach the method wherein the temperatures are maintained at isothermal conditions. However, it would have been obvious to one of ordinary skill in the art to maintain the temperature of the fermentation because it was routine practice in the art at the time

of the invention. In support, Tedder teaches a method for preparing alcohol by continuous fermentation wherein a fermentation liquor containing alcohol (broth) is formed (abstract) while the temperature is maintained (isothermal conditions) at 25 – 35C (col.3 line 5-8). Moreover, one of ordinary skill in the art would have been motivated by conventional practice to practice the method of Hallberg under isothermal (or constant) temperatures.

4. Claims 1, 11 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hallberg (US 5,070,016) in view of Tedder (US 4,517,298) as applied to claim 1 above, and further in view of Turpin et al. (US 5,110,319).

Applicant appears to claim a method for separating ethanol (EtOH) from a fermentation broth comprising fermenting microorganisms, nutrients and sugars as a broth, which produces EtOH and carbon dioxide (CO2), providing a flow of CO2, removing the CO2 and EtOH, separating EtOH and CO2, separating sludge and broth followed by adding microorganisms, nutrients and sugars wherein the concentration of EtOH of the broth is between 6 – 12%. The EtOH is then scrubbed with a solvent to provide CO2 and a solution containing EtOH.

Hallberg teaches a process for making EtOH by fermenting bacteria wherein CO2 is a by-product (abstract). The process includes fermenting a vegetable material in a broth to produce EtOH and CO2 wherein the EtOH is recovered from the broth (col.5 line 5-15). The fermentation vessel contains the microorganism and the CO2 exits (or separates from) the vessel where it is recovered in a CO2 recovery unit (col.5 line 67-col.6 line 5). Although Hallberg does not specifically teach providing CO2 to the fermentation vessel, Hallberg teaches inherent

characteristics of yeast in EtOH production require an aerobic stage, which produces CO2 (col.2 line 5-10), thereby providing a flow of CO2 to the fermentation vessel.

Hallberg does not specifically teach the method wherein sludge is removed and microorganisms, nutrients and sugars are added. However, Hallberg does teach the method utilizing continuous fermentation (col.8 line 37-41). Furthermore, Tedder teaches a process to produce ETOH wherein continuous fermentation of a feedstock yields a broth impregnated with alcohol (col.2 line 45-55). The feedstock is continuously replaced with microorganisms while the fermentation liquor and sludge is withdrawn (col.2 line 45-65). At the time of the invention, it would have been obvious to one of ordinary skill in the art to remove sludge and replace the microorganisms, nutrients and sugars as it was a common practice applied to continuous fermentation in the art at the time of the invention as demonstrated by Tedder. Moreover, one of ordinary skill in the art would have been motivated by conventional practice to remove sludge and replace microbes and substrates with a reasonable expectation of success for recovering EtOH from a continuous fermentation broth.

Hallberg does not teach regulating the concentration of EtOH within the broth to between 6 – 12%. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art to regulate the EtOH to a desired concentration because Tedder teaches continuous fermentation allows the concentration of alcohol in a fermentation vessel can be maintained at a constant desired level (col.2 line 60 – col.3 line 5). Moreover, at the time of the invention, one of ordinary skill in the art would have been motivated to optimize the EtOH concentration via continuous fermentation because it was known in the art to facilitate a regulated desired concentration as demonstrated by Tedder.

Hallberg does not teach scrubbing the EtOH with a solvent to provide CO2 and EtOH. However, at the time of the invention, one of ordinary skill in the art would have been motivated to do so because Turpin et al. teach a method for producing ethanol from a fermentation source wherein EtOH is extracted (or scrubbed) with a solvent and the fermentation broth is recycled back into the fermentor (abstract). In the method of Turpin et al., EtOH containing broth (solution with EtOH) is continuously removed (col.2 line 60-65) wherein it is extracted with a solvent (col.3 line 10-15). The EtOH-free broth is recycled back to the fermentor with nutrients and microorganisms (20-25) and the EtOH-containing extract is dehydrated (line 25-30) then blended with gasoline to produce gasohol (line 30-35). At the time of the invention, one of ordinary skill in the art would have been motivated by Turpin et al. to scrub/extract the EtOH with a solvent, particularly gasoline, with a reasonable expectation of success for separating out the EtOH and creating gasohol because it was a known technique in the art as demonstrated by Turpin et al.

5. Claims 1 and 17 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hallberg (US 5,070,016) in view of Tedder (US 4,517,298) as applied to claim 1 above, and further in view of Chambers (US 4,568,356).

Applicant appears to claim a method for separating ethanol (EtOH) from a fermentation broth comprising fermenting microorganisms, nutrients and sugars as a broth, which produces EtOH and carbon dioxide (CO2), providing a flow of CO2, removing the CO2 and EtOH, separating EtOH and CO2, separating sludge and broth followed by adding microorganisms, nutrients and sugars wherein the concentration of EtOH of the broth is between 6 – 12%. The

ETOH is scrubbed by gasoline to provide gasohol containing ETOH and CO2-containing gasoline, the gasohol containing water is dehydrated by forming a hydrate and dehydrated gasohol, the gasohol containing water is dehydrated by distillation forming an azeotrope and dehydrated gasohol and/or the CO2-containing gasoline is subject to adsorption to form CO2 substantially free of gasoline and an absorbate containing gasoline.

Hallberg teaches a process for making EtOH by fermenting bacteria wherein CO2 is a by-product (abstract). The process includes fermenting a vegetable material in a broth to produce EtOH and CO2 wherein the EtOH is recovered from the broth (col.5 line 5-15). The fermentation vessel contains the microorganism and the CO2 exits (or separates from) the vessel where it is recovered in a CO2 recovery unit (col.5 line 67-col.6 line 5). Although Hallberg does not specifically teach providing CO2 to the fermentation vessel, Hallberg teaches inherent characteristics of yeast in EtOH production require an aerobic stage, which produces CO2 (col.2 line 5-10), thereby providing a flow of CO2 to the fermentation vessel.

Hallberg does not specifically teach the method wherein sludge is removed and microorganisms, nutrients and sugars are added. However, Hallberg does teach the method utilizing continuous fermentation (col.8 line 37-41). Furthermore, Tedder teaches a process to produce ETOH wherein continuous fermentation of a feedstock yields a broth impregnated with alcohol (col.2 line 45-55). The feedstock is continuously replaced with microorganisms while the fermentation liquor and sludge is withdrawn (col.2 line 45-65). At the time of the invention, it would have been obvious to one of ordinary skill in the art to remove sludge and replace the microorganisms, nutrients and sugars as it was a common practice applied to continuous fermentation in the art at the time of the invention as demonstrated by Tedder. Moreover, one of

ordinary skill in the art would have been motivated by conventional practice to remove sludge and replace microbes and substrates with a reasonable expectation of success for recovering EtOH from a continuous fermentation broth.

Hallberg does not teach regulating the concentration of EtOH within the broth to between 6 – 12%. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art to regulate the EtOH to a desired concentration because Tedder teaches continuous fermentation allows the concentration of alcohol in a fermentation vessel can be maintained at a constant desired level (col.2 line 60 – col.3 line 5). Moreover, at the time of the invention, one of ordinary skill in the art would have been motivated to optimize the EtOH concentration via continuous fermentation because it was known in the art to facilitate a regulated desired concentration as demonstrated by Tedder.

Hallberg does not teach the method further comprising scrubbing the EtOH with gasoline to provide gasohol containing ETOH and CO2-containing gasoline wherein the gasohol containing water is dehydrated by forming a hydrate and dehydrated gasohol, wherein the gasohol containing water is dehydrated by distillation forming an azeotrope and dehydrated gasohol, or wherein the CO2-containing gasoline is subject to adsorption to form CO2 substantially free of gasoline and an absorbate containing gasoline. However, at the time of the invention, it would have been obvious to one of ordinary skill in the art to do so because Chambers teaches a method for making alcohol denatured with gasoline to make gasohol wherein the alcohol and gasoline are dehydrated in a drying column (abstract). Vapors of the gasoline carry the water and some alcohol as azeotropes forming vapors which condense to form a gasoline layer, which is returned to the column and a water layer is removed (abstract). At the

time of the invention, it was known in the art to use gasoline to scrub EtOH in order to provide gasohol and gasoline as demonstrated by Chambers. Moreover, at the time of the invention, one of ordinary skill in the art would have been motivated by Chambers to scrub EtOH with gasoline with a reasonable expectation of success for providing gasohol.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ruth A. Davis whose telephone number is 703-308-6310. The examiner can normally be reached on M-H (7:00-4:30); altn. F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached on 703-308-4743. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-4242 for regular communications and 703-308-4242 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0196.

Ruth A. Davis
September 10, 2001

LEON B. LANKFORD, JR.
PRIMARY EXAMINER